A Study of Determinants Influencing Students' Adoption Intention towards Generative AI Chatbots in Higher Education Institutions of Uttarakhand

A

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BY

Aatm Prakash Rai

(Enrollment No: RSIBS210055)

Under the Supervision of

Dr. Puneet Kumar Gupta
&
Dr. Santanu Roy

ICFAI Business School
The ICFAI University,
Dehradun
2024

The ICFAI University, Dehradun

Candidate's Declaration

I, **Aatm Prakash Rai**, declare that the synopsis entitled, ***"A Study of Determinants Influencing Students' Adoption Intention towards Generative AI Chatbots in Higher Education Institutions of Uttarakhand."*** being submitted in the partial fulfillment of the requirement for the award of the degree of Doctor of Philosophy in ***MANAGEMENT*** under ICFAI Business School, The ICFAI University, Dehradun during the academic year 2023-24.

It is the work that is expected to be carried out under the supervision of Dr. Puneet Kumar Gupta, Assistant Professor and Dr. Santanu Roy, Director, ICFAI Business School .It is further declared that the synopsis is within the plagiarism limit and copy of the same is attached as per the University norms.

Signature 19/09/24.

Date:19/09/2024

Candidate's Name

(Aatm Prakash Rai)

The ICFAI University, Dehradun

CERTIFICATE

This is to certify that the thesis entitled, ***"A Study of Determinants Influencing Students' Adoption Intention towards Generative AI Chatbots in Higher Education Institutions of Uttarakhand."*** is an original piece of work done by ***Aatm Prakash Rai*** under our supervision being submitted in the partial fulfillment of the requirement for the award of the degree of Doctor of Philosophy in ***Management*** under ICFAI Business School, The ICFAI University, Dehradun during the academic year 2023-24. Further, it is certified that the synopsis is within the plagiarism limit and copy of the same is attached as per the University norms.

19/09/2024

Signature of the Co-Supervisor in full

Name in Capital Letters
Dr. SANTANU ROY
Designation & Address
Professor & Director
ICFAI Business School
The ICFAI University, Dehradun

19/09/2024

Signature of the Supervisor in full

Name in Capital Letters
Dr. PUNEET KUMAR GUPTA
Designation & Address
Assistant Professor
ICFAI Business School
The ICFAI University, Dehradun

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ABSTRACT

The advancement of Artificial Intelligence (AI) tools such as Generative (Gen) AI Chatbots for self-learning in universities and higher education institutions worldwide is increasing exponentially. The purpose of this proposed study is to analyze the underlying factors of higher education Students' adoption of chatbots. The study intends to achieve four objectives. Firstly, it examines the critical factors that influence the adoption of Gen AI chatbots in higher education, as well as the impact of students' attitudes towards the adoption of Gen AI chatbots among students. In addition, the study examines the impact of students' perceived value on the adoption of Gen AI chatbots among students. The fourth part of the study focuses on developing a comprehensive model for the adoption of Gen AI chatbots among students.

Lastly, the study strives to provide recommendations for students, educators, technology developers, and policymakers to enhance the adoption of Gen AI chatbots among students. A multi-faceted exploration of the numerous factors that influence students' adoption of Gen AI chatbots seeks to deliver valuable understanding for their academic distinction.

1. Introduction

Previous decades observed the proliferation of new technologies and innovations. Some of these innovations and technologies were rapidly adopted by the society whereas some failed to get public attention. Awareness of the determinants affecting adoption of new technology and innovation caters to the recognition of the demand of the society which in turn results into acceptance of new technology. The question that why public adopt or accept an innovation or technology and uses it , is the most crucial research area in the domain of Information systems. The first technology acceptance model(TAM) was presented during the growth of computers in 1960s. Technology acceptance can be construed as acceptance and utilization of new technology. With the introduction of an innovation, many different factors are presented to the user who determines when and how to use new technology. Theories/models of technology acceptance and adoption facilitates anticipation of demands for newly introduced technology in dynamic business environment.(Liu et al.,2019) defines Technology adoption as a process of an individual's decision to integrate or not to integrate technology into their lives. However, Technology acceptance drives an individual's shift in mindset, attitude and knowledge and activities of an user for testing a novel technology (Van Biljon.,2008).

Information systems (IS) have greatly contributed to enhancing teaching and learning in higher educational institutions.IS has provided various platforms and tools which facilitated not only information flow management, real-time communication, and collaborative and interactive learning environment but also modernized the higher education sector by sharing educational resources with all other stakeholders. Learning Management Systems (LMS) facilitates educators to manage and organize course material and evaluation components effectively. "Online Collaboration Tools" in Google classrooms and Zoom have facilitated collaborations and communication between instructors and students. The data analytics enabled IS can be utilized to effectively monitor students' engagement, performance, and progress. As per recent Deloitte survey conducted by (Johnston, et al., 2024), students and employees from India are 30% more probable to have used gen AI chatbots than their counterparts in other parts of Asia Pacific. The survey emphasized the positive attitude of 75% of surveyed students and employees regarding gen AI to support Asia Pacific to play a greater role in the worldwide economy. Moreover, 83% perceive Gen AI to enhance social outcomes. Similarly, 84% of them confirmed that gen AI influenced their career related decisions.

Generative Artificial Intelligence (Gen-AI) tools such as Chatbots are nowadays widely integrated with IS for effective instruction and learning (Aditya Johri, 2023). Similarly, (Smolansky, 2023)explored the consequence of Gen-AI on students' assessments in university education and concluded that learners and educators have mixed reactions concerning academic integrity and the adoption of evaluation methods. The learning experience has boosted with the advent of AI tools such as machine learning and natural language processing. Chatbots can increase efficiency, save teachers' time, and provide accurate feedback, benefiting both educators and students. As per (Chang, 2022) , Chatbots can be categorized as computer programs that can initiate human conversations to facilitate exploring, building and sharing knowledge. (Pérez, 2020) identified chatbots as a software tool based on Natural Language Processing(NLP) and machine learning (ML) algorithms and are proficient in realizing and answering user queries through text, voice or avatars. Chatbot employs AI to reproduce human-to-human discussions and usually merge chat or other applications, achieving user-friendly interfaces. Since the inception of the first chatbot, ELIZA, developed by Joseph Weizenbaum in 1996, the utilization of chatbots has grown across all sectors, especially customer engagement and servicing (Fryer, 2019). As per a recent report of Fortune Business Insights, the Global market size of chatbots was estimated at USD396.2 million in the year 2019 and it is expected to reach a compound annual growth rate(CAGR) of 22.5% to USD1953.3 million by 2027 (Chatbot Market Size, Share & COVID-19 Impact Analysis, 2024). Similarly, Gen AI technology such as Educational chatbots is expected to reach a market size of $5.3 billion by the end of 2032, with a cumulative annual growth rate (CAGR) of 40.5% between 2023-2032 (Paliychuk, 2023).These figures achieve significant importance due to the increasing trend of imparting personalized learning experiences to learners (MohammedAl-Abdullatif, 2023). During the initial phase, the foremost objective of chatbots was to facilitate the simulation of human interaction by computer-generated interactions. Currently, the technologies such as Chatbots are being widely utilized in various sectors, like Retail and e-commerce, Travel and hospitality, Banking, financial services, insurance (BFSI), Healthcare, Automotive, Education, etc. (Shetty, 2024).

IBM (Church, 2023) classified chatbots into five types: button or menu-based chatbots, rules-based chatbots (interactive, used for recurrently asked questions), AI-powered chatbots, voice chatbots, and generative AI chatbots. Chatbot such as ChatGPT more than 100 million users globally. Remarkably, within 5 days of its launch in November 2022, 1 million users signed up. Notable, Instagram took 2.5 months to reach that number. This intensified interest in chatbots can be

attributed to the dominance of smartphones and high-speed internet connectivity. Generative Artificial Intelligence, like ChatGPT, works uniquely compared to conventional AI models. In preference to identifying patterns and creating predictions, it harvests new outputs, all-embracing text, audio, and video. With its ancestry in deep neural network designs, and more power-driven by "transformer designs", "Large Language Models (LLMs)" bind ample parameters, resulting in numerous natural language processing activities (openai, 2023).AI chatbots such as ChatGPT initiated by OpenAI, can produce reliable, contextually suitable replies based on previous conversations, providing an interactive platform for human conversation (Jo H. , 2024). The interactive capacity of chatbots such as ChatGPT can reorganize the academic landscape, by renovating the avenue via which students imbibe, relate, and involve in educational content (Fauzi, 2023). OpenAI's ChatGPT is a chatbot powered by Gen-AI, it is empowered to process large chunks of language data, accelerating prompt user outcomes. OpenAI's ChatGPT was made freely available to users since its launch in November 2022 (Alshammari et.al , 2024).

In the Education sector, the trend of students' interaction with AI chatbots is remarkably mounting, likely, due to the use of AI-powered technologies as imagined in a learners-centric academic society (Md. Shahinur Rahman, 2023). Students frequently use ChatGPT for tasks such as translating languages, refining content, and completing assignments. Similarly, utilizing AI-powered training programs is a compelling instrument for improving students' academic deliverables and motivation (Srinivasa, 2022). As per the study carried out by (Sengupta, 2020), the utilization of ChatGPT increases students' satisfaction and engagement. Gen Z is more tech-savvy, and their engagement level has been observed increasing while utilizing chatbots. ChatGPT is also useful to teachers in accomplishing several tasks, like querying for information, generating new ideas, translation facilities, etc., thereby increasing effectiveness and efficiency (Al-Sharafi, 2023). Most of the studies have concentrated on academics' perspective of Chatbots and its probable future uses (Bronwyn E. Howell, 2023), while students and factors affecting their intention toward using Chatbots have received little attention. Moreover, there is a lack of knowledge regarding how students accept and use Gen AI chatbot tools such as ChatGPT and the factors affecting them toward using it (Tiwari ct.al, 2024). Conversely, there is a paucity of research which analytically examined the determinants driving higher education students' adoption of Gen AI chatbots such as ChatGPT (Pahos, 2024). Even the use of Gen AI chatbot such as ChatGPT among teachers for educational perspective remain significantly new and underexplored (Bhaskar & Rana, 2024).To enhance adoption and utilization of gen AI chatbots,

understanding of the factors affecting students' intention to use Gen AI Chatbots is essential. This study will strive to fill the gap and suggests an abstract model for examining the determinants which could affect students' adoption of Gen AI Chatbots.

Research Problem

The rapid proliferation of Gen AI chatbots has significantly influenced various industries, including education. In higher education institutes, both faculty members and students have started using Gen AI chatbots. However, the factors influencing the acceptance and use of Gen AI chatbots such as ChatGPT among students and teachers for educational perspective remain significantly underexplored. Despite the growing presence of these technologies, there is a paucity of research, particularly within the Indian context, that comprehensively examines the determinants of student adoption of Gen AI chatbots. This proposed study seeks to address this gap by investigating the critical factors affecting students' intention to use Gen AI chatbots and by proposing a comprehensive model over the existing model.

Literature Review

The literature review was conducted in two phases. During the first phase, a broad review of technology acceptance and adoption theories and models was carried out to contemplate deep understanding of the distinct concepts and constructs discussed in the existing literature. In the next phase of the literature review, a leveled extraction and review of publications exclusively concentrated on Chatbot adoption in higher educational institutes was conducted. The summary of insights received from different theories and articles has been illustrated below.

2.1 Literature Review (Phase-1)

To gain a comprehensive understanding of the fundamental concepts encapsulated in the existing body of literature, an exhaustive examination of theories about the adoption of technology was undertaken during this stage. The concepts and frameworks employed in the realm of technology adoption, aimed at elucidating the way individual users accept new technological innovations, have undergone substantial development over the past four and a half decades. Presented below is a brief overview of this progression:

2.1.1 Fishbein and Ajzen's Theory of Reasonable Action (1975)

As per this mathematical model and cognitive theory, the " Attitude" of a person is the most important determinant of their "Behavioral Intention". Here a person's "belief" is one's understanding of the probability of some action leading to certain outcome or consequences. An individual's "Attitude" is one's own positive or negative evaluation of a particular behavior or outcome. A person's "intention" is one's own determination of behaving in a particular way in response to one' s belief and attitude (Fishbein, 1975)

2.1.2 Davis's s Technology Acceptance Model(TAM) (1986)

This theory is well known and widely used in the sphere of Information systems research. It helps to explain an individual's acceptance and individual's use intention recently introduced technology. The TAM comprises three important concepts; namely "Perceived Ease of use" (PEU), "Perceived usefulness" and "Attitude" towards using new technology.

PEU refers to consumer's perception of the use of new technologies with ease. PU refers to consumer's perception about the usefulness of the new technology and its impact on improving performance of an individual. "Attitude" towards using a new technology is influenced by "Perceived Ease of use" and "Perceived usefulness". The "Attitude" of a consumer directs his "Behavior Intention"(BI) to use newly introduced technology, and which finally leads to "acceptance" of newly introduced technology (Davis F. D., 1986).

2.1.3 Ajzen's Theory of Planned Behavior (TPB) (1991)

TPB broadened the Theory of Reasoned Action(TRA). This theory is widely used to predict and understand human behavior. The core components of TPB are "Behavioral Intention" and "Predictive power". " Behavioral intention" is influenced by the "Attitude" of an Individual, "Subjective norms" and "Perceived Behavioral control". The "Attitude" of an individual is one's understanding about the result of a particular behavior, whether it is favorable or unfavorable. "Subjective norms" reflect on the influence of family, friends, and others over "Behavioral Intention". "Perceived Behavior control" highlights an individual perception regarding the easiness or difficulty of performing a particular behavior." "Attitude", "Subjective Norms" and "Perceived Behavioral Control" collectively determine one's "Behavioral Intention". "Predictive power" determines the strength of the behavioral intention in a particular way. Therefore, the

higher the strength of “Behavioral Intension” greater likelihood of performing a specific behavior will be observed (Ajzen, 1991).

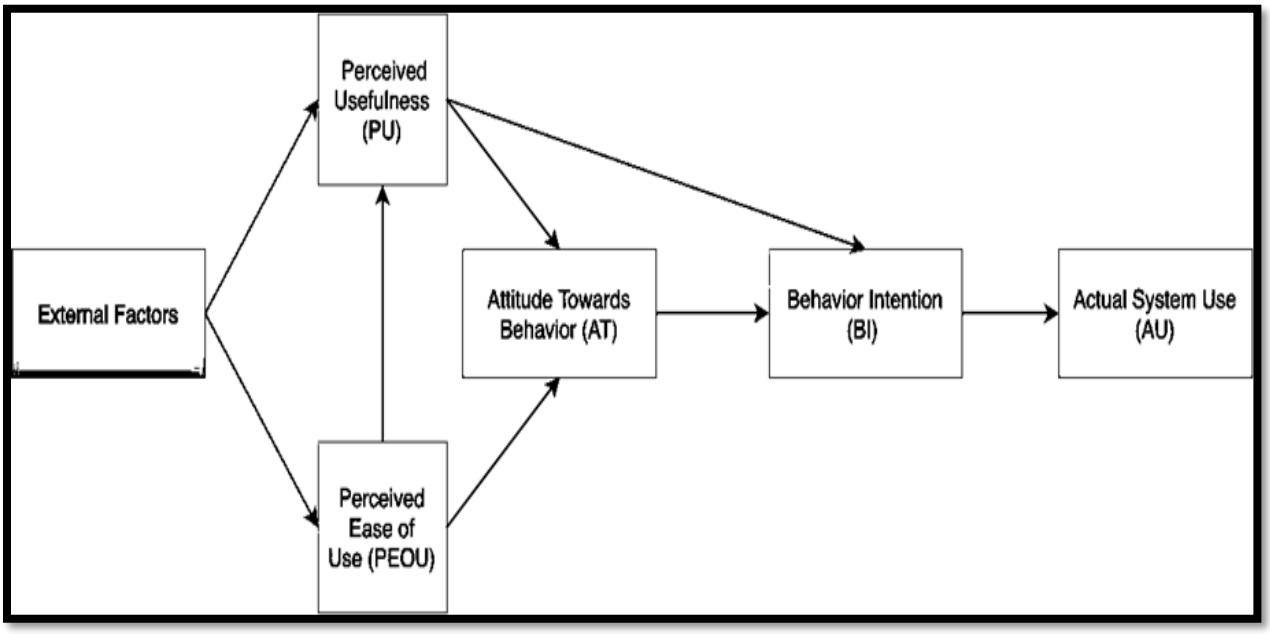

Figure 2.1 – TAM extracted from (Davis F. D., 1986)

2.1.4 Rogers’ Theory of ‘diffusion of innovation’ (1995)

(Rogers, 1995) "diffusion of innovation" hypothesis facilitated further investigation into the acceptance and implementation of innovation. His research involved the synthesis of over 500 diffusion studies concerning the adoption of innovation by individuals and institutions. The concept suggests that a new idea diffuses and establishes itself within a social system over time. According to this notion, the process of innovation and adoption unfolds through various stages including understanding, decision-making, persuasion, implementation, and confirmation.

2.1.5 Decomposed Theory of Planned Behavior

In 1995, Taylor and Todd proposed the "Decomposed Theory of Planned Behaviour" (DTPB), which expands on the original “Theory of Planned Behaviour” by breaking it down the three primary determinants “Attitude”, “Subjective Norms”, and “Perceived Behavioural Control” into more detailed dimensions. Our beliefs about the behavioural outcome and our internal evaluation of that outcome influence our attitude towards adopting a new technology (Taylor & Todd,

Understanding information technology usage: A test of competing models, 1995).

The “behaviour”, “opinion” and “expectations” of the people around us set norms for us and which is termed as “Social Influence”. Constructs such as “Self-efficacy” and “External Constraints” influence our “Perceived control” over our behaviour. “Self-efficacy” reveals the confidence that one has in one's ability to perform a particular behaviour and “External Constraints” highlight barriers or facilitators for a particular behaviour.

2.1.6 Technology Acceptance Model (TAM-2)

The “Technology Acceptance Model 2 (TAM2)” improves on the “Technology Acceptance Model (TAM)” by adding “external variables” that influence users’ behavioural intention to utilize new technology. (Venkatesh & Davis, 2000) developed TAM2 in year 2000, TAM2 incorporates the following factors in the original TAM: -

i.) Subjective Norms: It reflects the influence of society and people around us on our intention to behave in a particular way.

ii.) Image: It relates to an individual's perception of how using a particular technology impacts one's reputation in the work environment.

iii.) Job Relevance: An Individual’s perception of how using a particular technology will be connected to their job and task environment.

iv.) Output Quality: It refers to an individual’s perception that how well the technology does the given task.

v.) Result Demonstrability: When the benefits are easily apparent, it directly affects the user’s perception of usefulness of the system.

vi.) Experience Over Time: TAM2 model used Users’ experience with the technology, their acceptance of technology may change over time. Used as moderators.

vii.) Voluntariness: Whether the novel technology or system usage is Voluntary or mandatory. It was used as Moderator.

2.1.7 Unified Theory of Acceptance and Use of Technology (UTAUT)

(Venkatesh V. M., 2003) developed the “Unified Theory of Acceptance and Use of Technology (UTAUT)” after analyzing various theories on technology acceptance/adoption. UTAUT combines eight technology adoption theories/models. The theories/models whose overlapping

constructs were merged are “the Theory of Reasoned Action (TRA)”, “Technology Acceptance Model (TAM)”, “Theory of Planned Behavior (TPB)”, “Motivational Model (MM)”, “Social Cognitive Theory (SCT)”, “Model of PC Utilization (MPCU)”, “Innovation Diffusion Theory (IDT)”, and Combined TAM and TPB. This model highlights “Performance Expectancy (PE)”, “Effort Expectancy (EE)”, “Social Influence (SI)”, and “Facilitating Conditions (FC)” as the main factors influencing users' behavioral intention (see Figure 2.2). Determinants affecting “Performance Expectancy” are “Perceived usefulness”, “Extrinsic motivation”, “Work-fit”, “Relative advantage”, and “outcome expectations”. “Effort expectancy” includes “perceived complexity” and “Ease of use” as key components. Moderating variables include “Voluntariness”, “Gender”, “Age” and “Experience”. The study concluded that “Behavioral Intention (BI)” and “Facilitating Conditions (FC)” affected “Use Behavior”, while “Performance Expectancy (PE)”, “Effort Expectancy (EE)”, and “Social Influence (SI)” affected BI. In addition, the study concluded that “Social Influence” did not significantly affect “Voluntariness”.

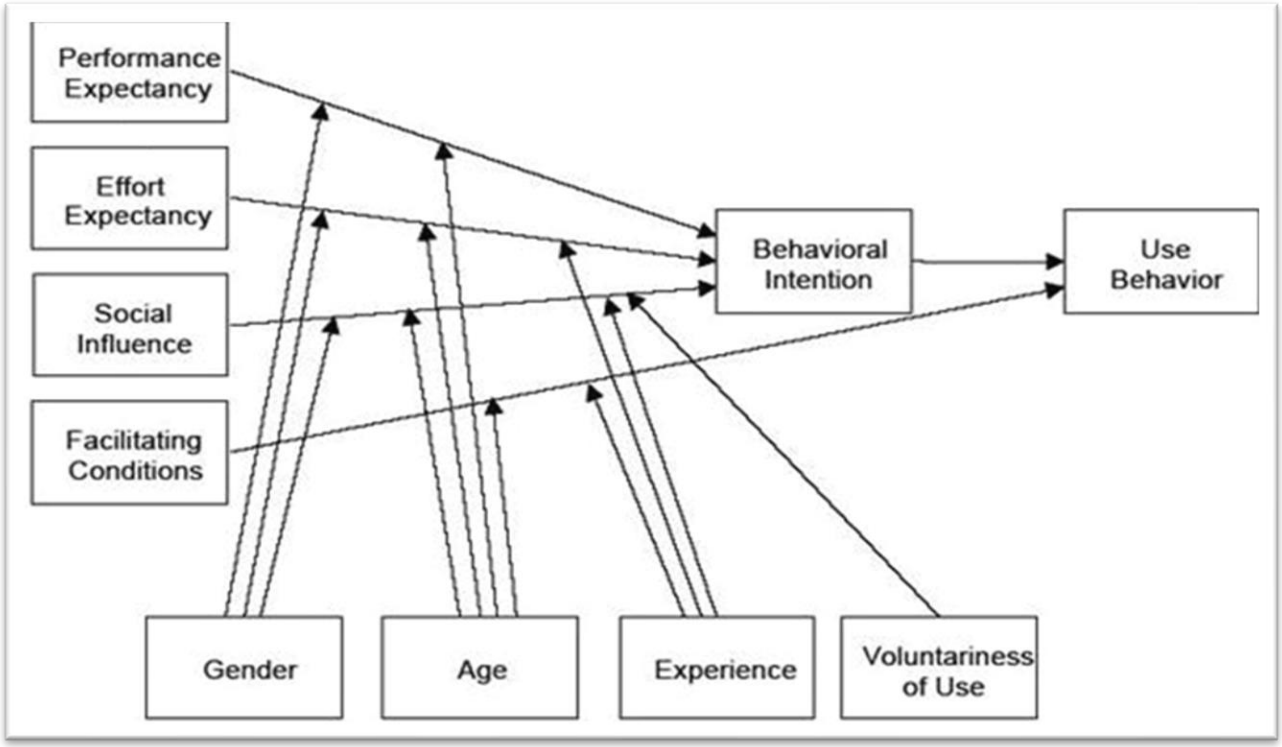

Figure 2.2 - UTAUT Model extracted from (Venkatesh V. M., 2003)

2.1.8 Value-based Adoption Model (VAM)

(Kim, 2007) focused on “Value maximization” perspective in their study about adoption of Mobile Internet. This theory was conceptualized considering the theories of “Consumer Choice” and “decision-making” from the research domains of economics and marketing. The authors argued that new ICT adopters are both technology users as well as service consumers, and they utilize the new ICT for their personal use; therefore, the cost of voluntary usage and adoption is incurred by the individual user. Rather, the new ICT adopters are consumers instead of users. The authors explained that the individual's selection of a particular behavior is dependent on the “highest payoff”. The cost-benefit analysis principles were also illustrated in the concept of value, which is largely termed as the trade-off between total benefits received and total sacrifices made. As per this model “Perceived Usefulness” and “Perceived Enjoyment” provide benefits to an individual whereas “Perceived Technicality” and "Perceived Fee” are the causes of sacrifice. Figure 2.3 depicts the Value-based adoption model.

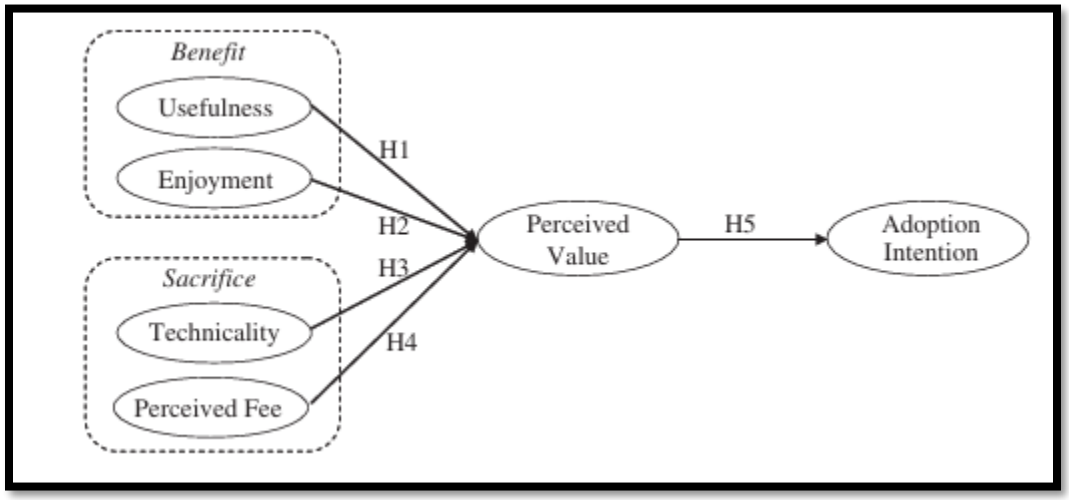

Figure 2.3 Value-based adoption model extracted from (Kim, 2007)

2.1.9 Technology Acceptance Model (TAM-3)

(Venkatesh & Bala, 2008) combined the TAM 2 Model with the Determinants of Perceived Ease of Use to create the Integrated Model of Technology Acceptance, known as TAM 3 which follows three stage process namely external factors, cognitive response and affective response. This framework included ”External factors(system design features) which trigger cognitive responses such as “Perceived usefulness (PU)” and “Perceived Ease of use (PEU)”.This results in affective response(attitude toward using technology/intention). In the TAM 3 model, “Experience” and

"Voluntariness" served as a moderator between PEU and PU, PEU and Computer Anxiety, and PEU and Behavioral Intention (BI). The model was validated empirically using real-world IT deployment scenarios.

2.1.10 Unified Theory of Acceptance and Use of Technology (UTAUT2)

In contrast to UTAUT, which focused on employees, UTAUT2 (Venkatesh V. T., 2012) directed its attention towards consumers. The emphasis of UTAUT2 was on utilitarian value, influenced by extrinsic motivational factors. Additionally, three intrinsic motivational factors - Habits, Hedonic Motivation, and Price Value - were integrated into the UTAUT2 model (Figure 2.4) to complement the existing intrinsic factors. Users' demographic characteristics such as age, gender, and experiences were considered as moderating variables that could impact the relationship between independent variables and Behavior Intention, as well as the use of ICT. The UTAUT2 model exhibited a substantial enhancement over UTAUT, demonstrating an increase in the explanation of variance in both Behavioral Intention (from 56% to 74%) and Use Behavior (from 40% to 52%) in the empirical investigation.

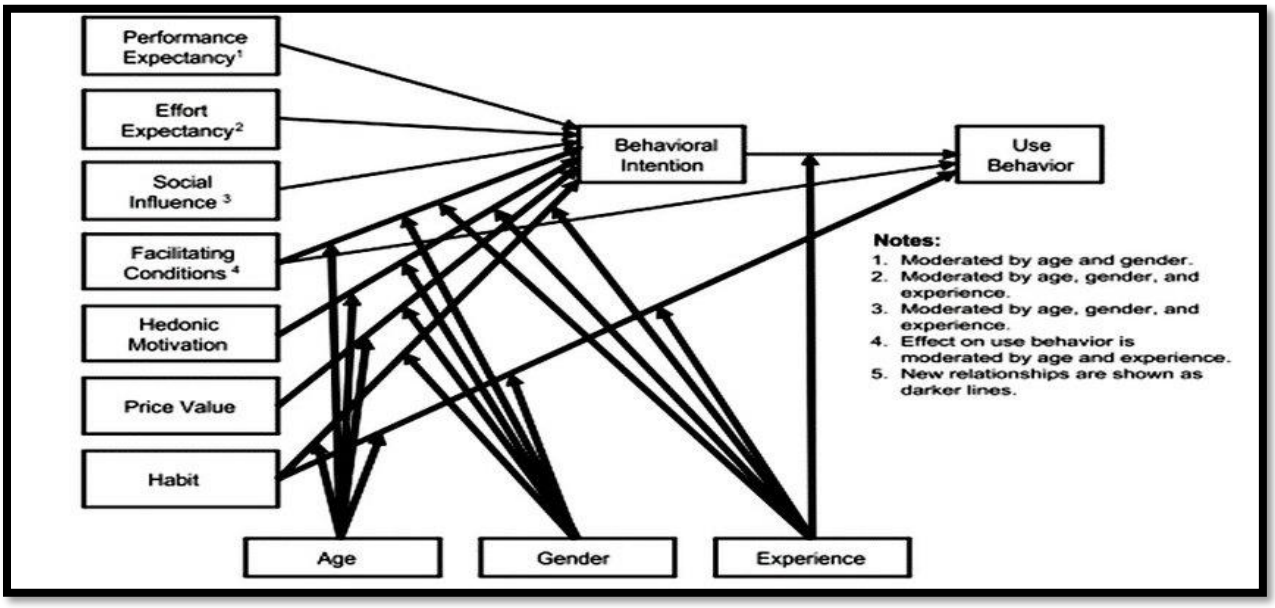

Figure 2.4 – UTAUT-2 Model extracted from (Venkatesh V. T., 2012)

2.1.11 Unified Theory of Acceptance and Use of Technology (UTAUT3)

The expanded unified theory of acceptance and use of technology (UTAUT2) has been added to the body of knowledge by (Farooq, 2017) with the introduction and validation of a new construct, namely personal innovativeness (PI). By accomplishing this and using a strict technique of partial

least square (PLS) based structural equation model (SEM), they have contributed significantly to theory, methodology, and context in addition to yielding a significant potential reward in the context of poor nations. The study's conclusions have validated the importance of personal innovativeness (PI) in the information technology (IT) industry as a crucial personality characteristic that influences consumers' adoption and usage of the technology. In addition, the study validated the existing constructs of the extended unified theory of acceptance and use of technology (UTAUT2). The study's findings support the notion that the adoption of the newest technological innovations, like lecture capture systems, is significantly influenced by several factors, including performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM), price value (PV), habit (H), and personal innovativeness (PI).

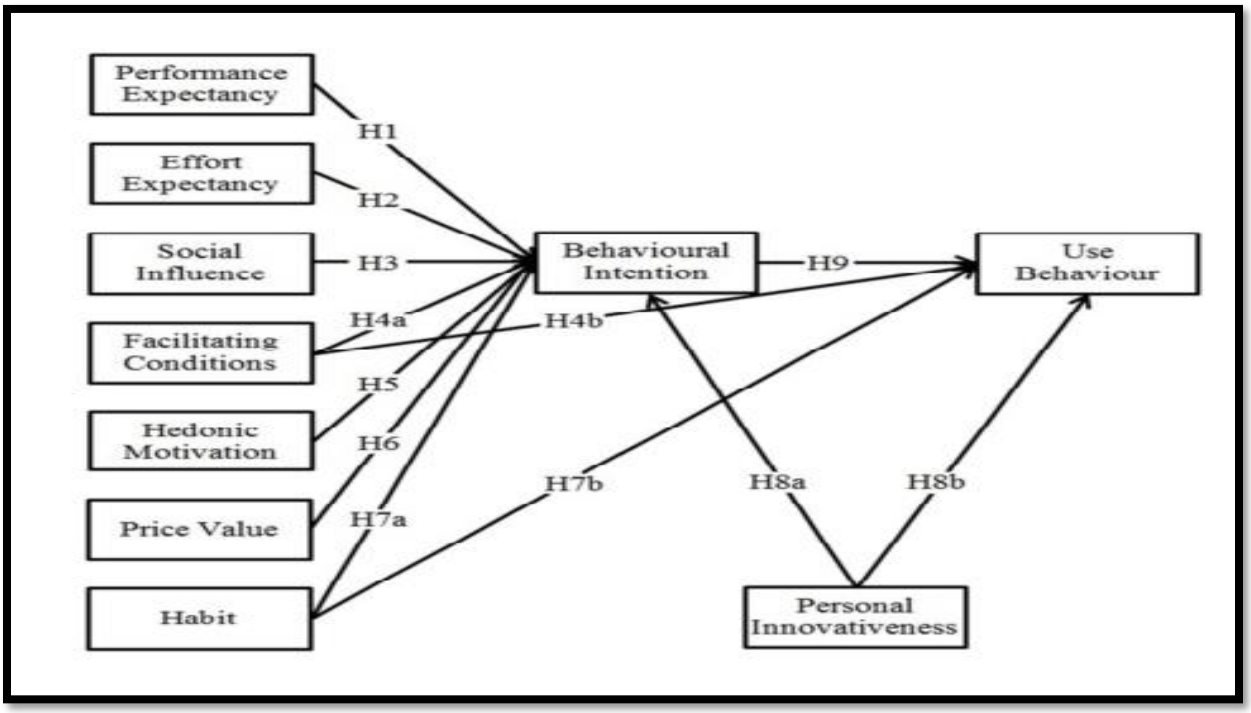

Figure 2.5 – UTAUT-3 Model extracted from (Farooq, 2017)

Table 2.1: Transformation in Information System Adoption Model Research

S. No	Model/Theory	Citation	Constructs/ Salient aspects	Remarks
1	Theory of Reasoned Action (TRA)	(Fishbein, 1975)	Attitude and Subjective Norms are important factors	Personal factors in focus
2	Theory of Interpersonal Behavior (TIB)	(Triandis, 1977)	Attitudes, Personal beliefs, and social factors play a significant role	TRA expanded by adding Social factors
3	Expectation-Confirmation Theory (ECT),	(Oliver, 1980)	Customers' intention to purchase is influenced primarily by the satisfaction they had with the prior use of the service or product	Prior Usage is the only personal factor considered
4	Technology Acceptance Model (TAM)	(Davis F. D., 1986)	Perceived usefulness and perceived ease of use are two important determinants for intention to adopt a new technology.	Extrinsic Factors such as Technological factors were only emphasized.
5	Social Cognitive Theory	(Bandura, 1986)	Personal factors, and Environmental influences which affects behavior of an individual.	TIB was combined with Environmental influences(Observing positive and negative reinforcement of others behavior).
6	Theory of Planned Behavior (TPB)	(Ajzen, 1991)	Attitude, Subjective Norms(Social influence), Perceived Behavioral Control (one's ability to channelize one's own behavior)	TRA enriched with Perceived behavioral control factors
7	Perceived Characteristics of Innovating	(Moore, 1991)	Voluntariness, Relative advantage, compatibility, image, ease of use, result demonstrability, visibility and trialability	Technology Factors (such as Relative advantage, Trialability, Observability, Compatibility, Complexity, Perceived Risk)
8	Model of PC Utilization (MPCU)	(Thompson, 1991)	Affect (Feelings), Social Norms, Habits, Expected Consequences(complexity, job fit, long-term planning) and	Drawn from TRA and TPA by offering an alternative context. TRA and TPA focusses on Intention whereas

			Facilitating conditions	MPCU focusses on actual behavior
9	Motivational Model	(Davis F. D., 1992)	computer playfulness and enjoyment significantly influence Intrinsic Motivation. However, perceived usefulness, perceived ease of use, and subjective norm form part of Extrinsic motivation	Intrinsic motivation factored-in to TAM-1.It overcomes the limitation of TAM-1 that if someone intends to act, then they can do without limitation.
10	Igbaria's Model	(Iqbaria, 1994)	Perceived fun and perceived usefulness are important determinants	Perceived fun replaced perceived ease of use (of TAM-1 model)
11	Decomposed theory of Planned Behavior	(Taylor & Todd, 1995)	This theory Decomposed Attitudinal Belief Structures and Subjective Belief Structures. Attitude decomposed into Compatibility, Perceived Ease of Use and Perceived Usefulness. Decomposed Subjective Norms into past experience of individual ,effects of reference group types. Decomposed Control Belief Structures (Self-Efficacy and Facilitating conditions) -> Behavioral Intention	Extension of the Theory of Planned Behavior by adding the antecedents of the 3 attitude beliefs
12	Theory of Diffusion of Innovation	(Rogers, 1995)	Five Stages of adoption are Knowledge, Persuasion, Decision, Implementation and Confirmation. Five categories of adopters of Innovation -Innovators, early adopters, early majority, late majority and laggards.	Applicable in organizational setting
13	Information System Success Model	(DeLone, 1995)	Six IS success factors: system quality(reliability, usability and response	Focus only on Technical Factors

			time), information quality(accuracy, relevance, timeliness, comprehensiveness), service quality(responsiveness, assurance and empathy), User satisfaction, net benefits(decision-making, productivity and competitive advantage on Individuals, organizations and society)	
14	Task Technology Fit (TTF model)	(Goodhue, 1995)	Task Characteristics (task complexity, interdependence and variability) and Technology Characteristics (ease of use, functionality, compatibility and reliability),Task Technology Fit (degree to which technology supports the task), Performance Impacts (efficiency, effectiveness and overall performance)	Focus on synching technological factors with Task orientation. TTF model is applicable for evaluating the actual use of technology with reference to task to be performed.
15	Combined model of TPA and TAM	(Taylor & Todd, 1995)	TPB merged with Perceived Usefulness and Perceived Ease of Use (from TAM model)	Technological and Personal Factors merged
16	TAM-2	(Venkatesh & Davis, 2000)	Additional constructs (Subjective norms, Voluntariness, image, Job relevance, output quality and result demonstrability) were added	TAM-1 extended by incorporating social and cognitive factors Experience and Voluntariness were tested as moderators and Carried out in 4 longitudinal studies
17	Unified Theory of Acceptance and Use of Technology (UTAUT)	(Venkatesh et al., 2003)	Performance Expectancy(PE), Effort Expectancy(EE), Social Influence(SI), Facilitative	They integrated eight basic models to derive the constructs. TRA, TAM, MM, TPB, MPCU, SSCT,

			Conditions(FC) are the main constructs	Combined TAM and TPB, and IDT. Focuses on the acceptance of technology by employees in the organizational context. The focus is only on extrinsic motivators and hence applicability of the model is limited to users' utilitarian use of technology. This could explain 56% of the variance in BI and 40% in use.
18	Technological Pedagogical Content Knowledge Framework (TPCK)	(Mishra, 2006)	Content Knowledge (CK), Pedagogical Knowledge (PK) and Technology Knowledge (TK) . TPACK emphasized on the intersection of above core concepts and resulting in Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Pedagogical Content Knowledge (PCK)	Applicable to the teaching and learning environment and focused only on Knowledge factors relevant to teachers. Complex factors used therefore few studies used this model.
19	Value-based Adoption Model (VAM)	(Kim, 2007)	Usefulness and enjoyment are the main factors contributing to benefits whereas Technicality and Perceived Fee are the main constructs resulting in Sacrifice.	Amalgamation of the theories of consumer choice and decision-making from economics and marketing research into Adoption theories. It explains adoption from the perspective of Value maximization.
20	TAM-3	(Venkatesh & Bala, 2008)	Perceived Usefulness, Perceived Ease of Use (Self-Efficacy, Perceptions of External Control, Anxiety and Playfulness)	Extension of TAM-2. Self-experience replaced cognitive influence. Social influence was replaced with personal

				factor (Computer Anxiety)
21	Uses and Gratification Theory	(Grellhesl, 2012)	Motivations, Behavioral usage and gratifications /satisfaction	Only intrinsic motivational factors
22	UTAUT-2	(Venkatesh et al., 2016)	Three variables were added to UTAUT (Habit, Hedonic motivation and Price value). moderating variables(age, gender and experience, and voluntariness).	The study addressed issues with the UTAUT model identified in previous empirical research. It included additional intrinsic motivational factors, making the model more applicable across various industries, user groups, and usage scenarios. The study found that it can account for 74% of the variance in Behavioral Intention and 52% in Use of Technology, representing an improvement over the original UTAUT model.
23	UTAUT-3	(Farooq, 2017)	Personal innovativeness was used as a determinant of behavior intention and use of technology.	58% of the variance in BI and 68.2% in Use of Technology shows improvement over UTAUT2.

2.1 Phase-II of Literature Review

During Phase II, a Systematic Literature Review (SLR) was conducted on all the publications indexed in the Web of Science (WOS) and Scopus databases. Additionally, relevant theses from Shodhganga, the repository of PhD theses maintained by Inflibnet and approved by Indian Universities, were also studied. Scopus and Web of Science are reputable databases in the Academic world. Depending on these databases is also necessary to have access to a plethora of selected journals without doubting the reliability and relevance of the information received. The existing knowledge gaps can also be identified with the help of these databases by the researchers,

and tracking changing research orientations is also essential to maintain high research credentials as to highlight the credibility of their research work to the larger academic community. A query was generated on 12th June 2024 for published articles on Scopus and Web of Sciences (WoS) databases. The query contained the following keyword strings: ((“theor*" OR "Model”) AND (“Chatbot*” OR “ChatGPT” OR “GenAI*” OR “Generative AI*”) AND (“Adoption" OR "Acceptance”) AND (“ Higher Education*” OR “HEIs” OR “Universit*")), 140 articles from Scopus and 304 articles from WoS database were retrieved for the literature review (Refer screenshots in Figure 2.5 and 2.6). Bibliometric analysis of the consolidated extracted records from the Scopus and Web of Science databases is demonstrated below in Table 2.2.

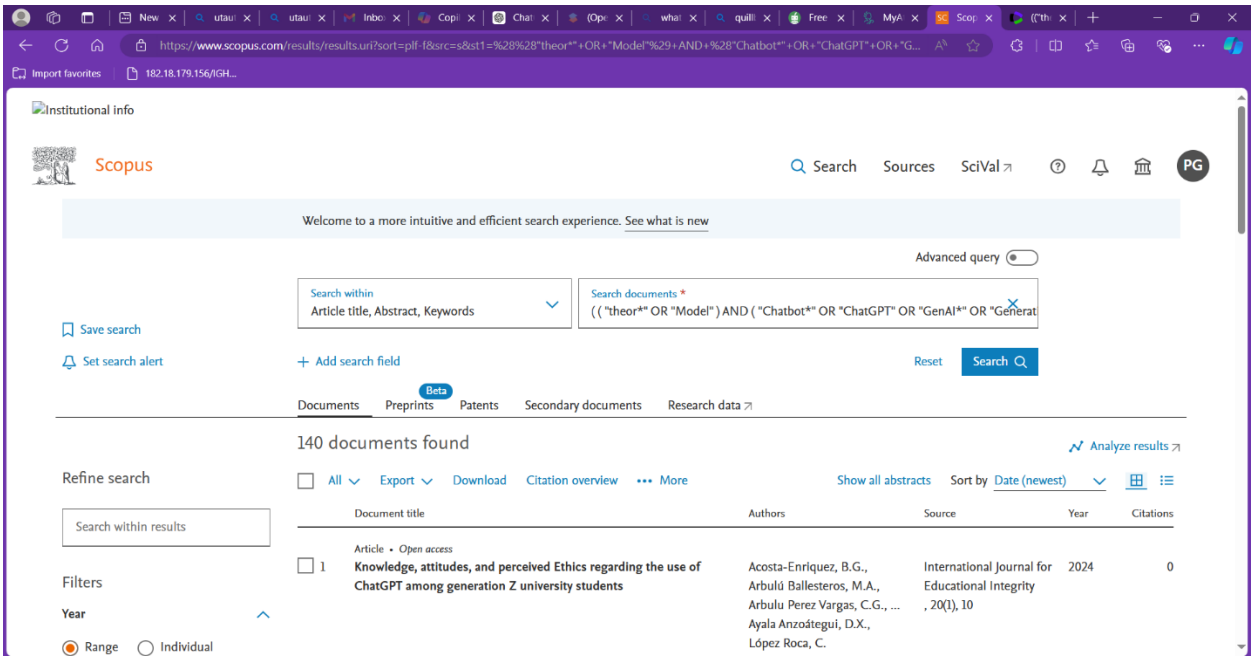

Figure 2.6: Query Results from Scopus

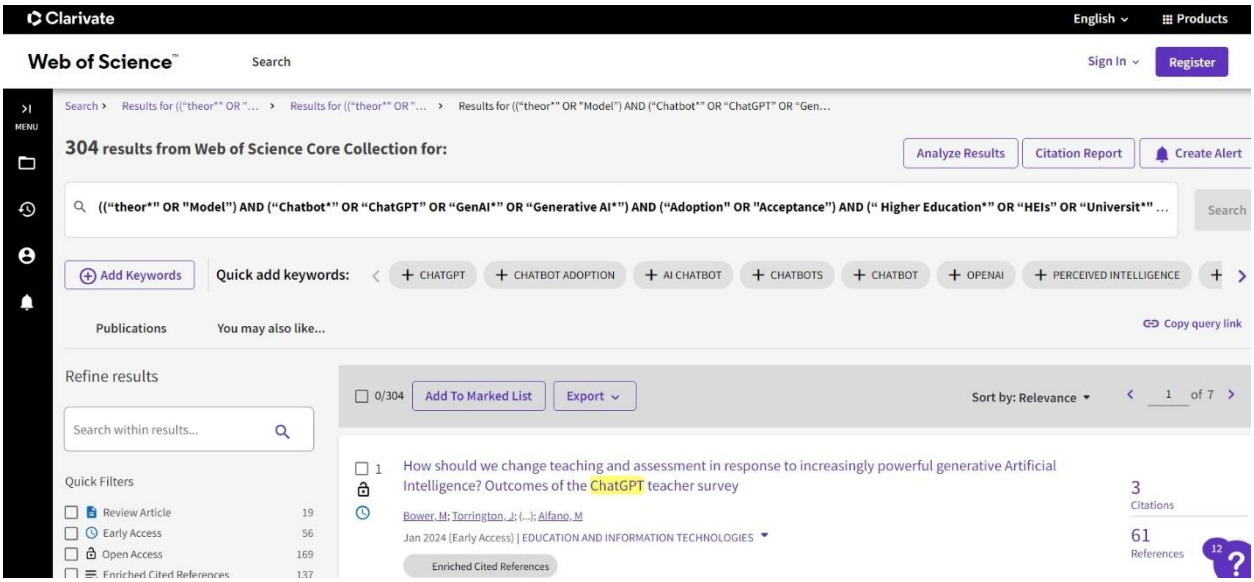

Figure 2.7: Query Results from WoS

Table 2.2 Bibliometric Analysis of Consolidated Extracted Record from Databases

Year	No. of Articles
2013	2
2018	5
2019	10
2020	14
2021	26
2022	48
2023	166
2024	187
Grand Total	**458**

Table 2.3 Tabulation of no. of Occurrence of Adoption models

Models	Occurences
UTAUT	9
UTAUT2	11
TAM	15
VAM	3
Others	6
Total	49

Table 2.3 Tabulation of various stakeholders

Stakeholder's	No. of Articles
Teachers	3

Students	**46**
Review	**0**
Grand Total	**49**

Table 2.4 Tabulation of Language of Research Articles

Language	No.of Articles
English	457
Spanish	1
Total	458

Table 2.5 Tabulation of the number of research articles reviewed as per Geographical area

Geographical Area	No. of Studies
Asia	**21**
Europe	**14**
Africa	**9**
Middle East	**3**
India	**2**
Total	**49**

Table 2.6 Tabulation of the types of the articles

Type of Articles	**No. of Articles**
Book chapter	30
Conference paper	42
Journal Article	365
Review	18
Grand Total	**458**

"The preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA)" flow chart is shown below in Figure 2.8.

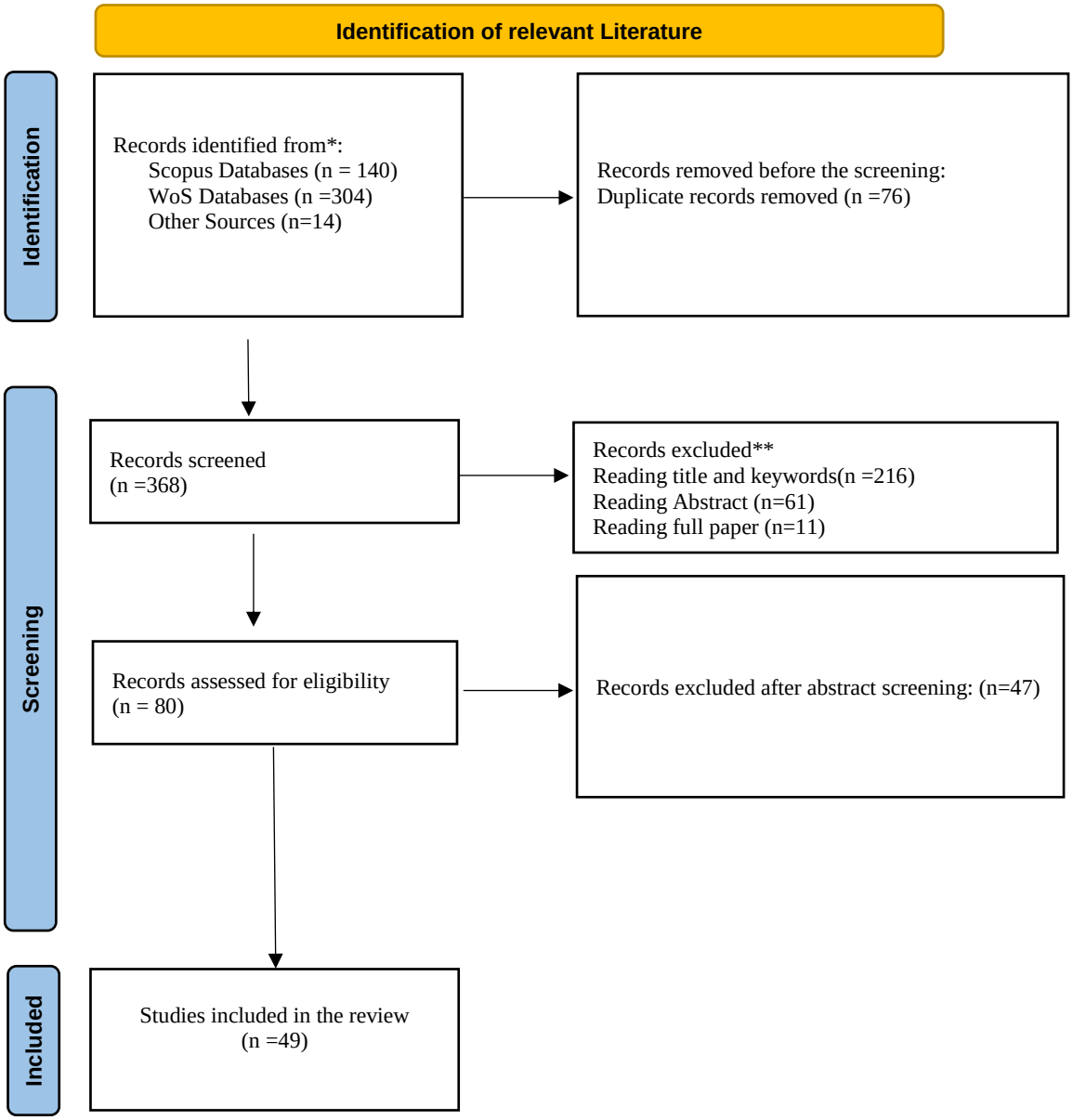

Figure 2.8: Flow diagram for the selection of study

a) Research Gap

Existing research on the adoption of Gen AI chatbots primarily focuses on developed countries and often utilizes models like UTAUT and its variations. However, there is limited research in the Indian context, particularly in Uttarakhand, that explores the constructs impacting the acceptance or adoption of chatbots among students. Additionally, the Value-based Adoption Model (VAM), which considers barriers such as perceived technicality & perceived cost, has been underutilized in this area. The study proposed addresses these gaps by suggesting a modified VAM model for understanding Gen AI chatbot use behaviour and acceptance among students.

b) Research Questions

1. What are the critical factors influencing the adoption intention to use Gen AI chatbots among students of higher education institutes in Uttarakhand?
2. How does students' attitude affect their adoption intention to use Gen AI chatbots?
3. What is the impact of students' perceived value on their adoption intention to use Gen AI chatbots?
4. How do personal innovativeness, perceived cost, and self-efficacy influence students' adoption intention to use Gen AI chatbots?

c) Research Objectives

Based on the gap identified from the literature review, the research work proposed to cover the following objectives:

1. *To identify the critical factors influencing the adoption intention towards Gen AI chatbots among students of Higher Education in Uttarakhand*
2. *To analyze the impact of students' attitude on adoption intention towards Gen AI chatbots among students of Higher Education in Uttarakhand*
3. *To analyze the effect of students' perceived value on adoption intention towards Gen AI chatbots among students of Higher Education in Uttarakhand*
4. *To develop a comprehensive model for the adoption intention towards Gen AI chatbots among students of Higher Education in Uttarakhand.*

Hypothesis Development and Conceptual Framework

Post analysis of the numerous theories and models on technology acceptance and adoption, it is proposed to use Value-based adoption model by adding the “Social Influence”, “Personal Innovativeness”, “Self-Efficacy” as mediators and removing and replacing “Perceived Fee” with “Perceived Cost” as determinants of adoption of Gen AI Chatbots among students.

Constructs:

“Attitude” and “Perceived Value” are mediating constructs and “Intention to use Gen AI Chatbot” is considered a dependent construct while the independent variables are, seven constructs, incorporating one “Perceived usefulness” derived from the original TAM model (Davis F. D., 1986) and three constructs namely, "Personal Innovativeness", “Social Influence” and “Self-Efficacy” are adapted from UTAUT3 (Farooq, 2017). Two constructs are adapted from the VAM model (Kim, 2007); namely, “Perceived Enjoyment” and “Perceived Technicality”. We propose replacing "Perceived fee" with “Perceived cost” because of the user's different types of monetary and non-monetary costs.

Definitions of Constructs

- Perceived Usefulness (PU): “The degree to which students believe that chatbot technology benefits them by improving their learning performance”.
- Perceived Enjoyment (PE): “The extent to which students perceive that using chatbots offers interesting and delightful learning experiences”.
- Perceived Technicality (PT): “The degree to which chatbot is perceived as being technically excellent in the process of providing services”.
- Social Influence (SI): “The degree to which an individual perceived that important others believe that he or she should use the chatbot”
- Personal Innovativeness(PI): “The personality trait that reflects the tendency of certain individuals to try out and adopt the latest advancements in IT”.
- Self-Efficacy(SE): “It is a person’s belief in their ability to succeed in a particular situation or accomplish a task”.

- Perceived Cost (PC): " It encompasses both monetary costs (such as subscription fees) and non-monetary costs (such as time, effort, and cognitive load) that users associate with adopting and integrating chatbots into their academics.

Intermittent Variables

- Attitude (A)- "It reflects a user's overall evaluation of a chatbot based on its perceived benefits and ease of use".
- Perceived Value (PV)- "Users' overall perception of chatbot based on the considerations of its benefits and sacrifices needed to acquire and/or use it."

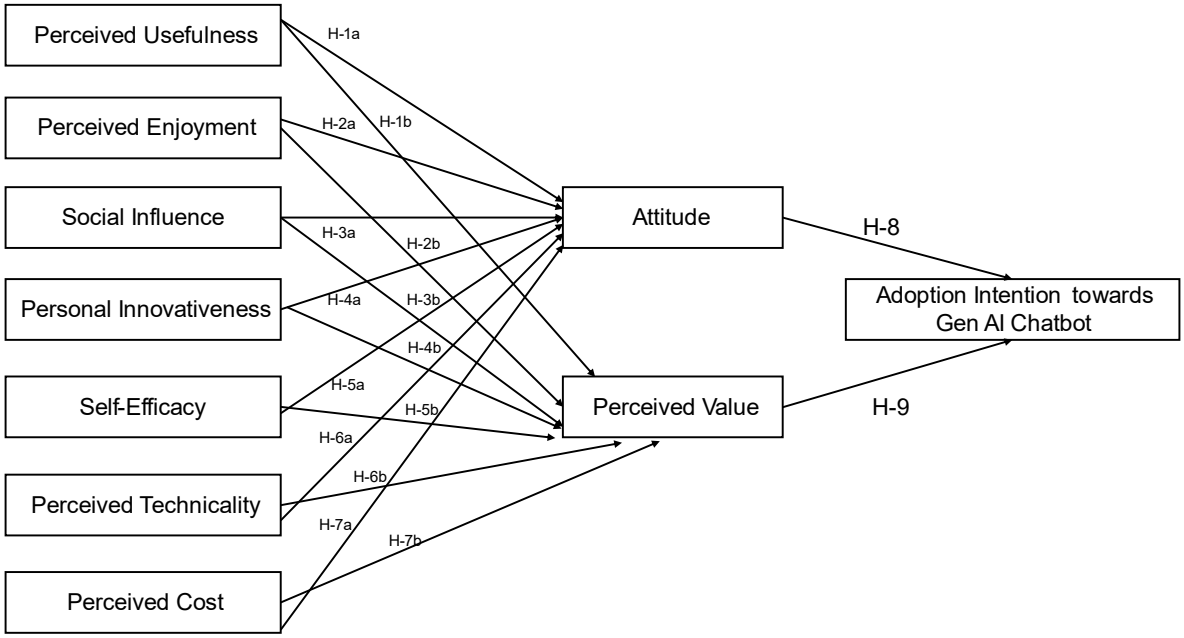

Figure 2.9: Proposed Model

The following section explains the hypothesis testing for direct and indirect effects:

To investigate the influence of diverse factors drawn in the suggested research model (Figure 2.9) on the "behavioral intention" towards adopting chatbots, the succeeding hypotheses have been set forth:

Direct effects

H_{1a}: "Perceived usefulness positively influences the students' attitude to use Gen AI chatbots for educational purposes"
H_{1b}: "Perceived usefulness positively influences the students' perceived value towards Gen AI chatbots for educational purposes"

H_{2a}: "Perceived Enjoyment positively influences the students' attitude to use Gen AI chatbots for educational purposes "
H_{2b}: "Perceived Enjoyment positively influences the students' perceived value towards Gen AI chatbots for educational purposes "

H_{3a}: "Perceived Technicality negatively influences the students' attitude to use of Gen AI chatbots for educational purposes"
H_{3b}: "Perceived Technicality negatively influences the students' perceived value towards Gen AI chatbots for educational purposes"

H_{4a}: "Perceived cost negatively impacts the attitude of management students towards using Gen AI chatbots for educational purposes"
H_{4b}: "Perceived cost negatively impacts the perceived value of management students towards Gen AI chatbots for educational purposes"

H_{5a}: "Social Influence positively influences the students' attitude to use Gen AI chatbots for educational purposes"
H_{5b}: "Social Influence positively influences the students' perceived value towards Gen AI chatbots for educational purposes"

H_{6a}: "Self-efficacy positively influences the students' attitude to use Gen AI chatbots for educational purposes"
H_{6b}: "Self-efficacy positively influences the students' perceived value towards Gen AI chatbots for educational purposes"

H_{7a}: "Personal Innovativeness positively influences the students' attitude to use Gen AI chatbots for educational purposes"
H_{7b}: "Personal Innovativeness positively influences the students' perceived value towards Gen AI chatbots for educational purposes"

H_{8}: "Attitude positively influences the students' adoption intention towards Gen AI chatbots for educational purposes"
H_{9}: "Perceived value positively influences the students' adoption intention towards Gen AI chatbots for educational purposes".

d) Research Methodology

For the proposed study, we will use both exploratory and descriptive research designs. We will adapt the questionnaire to cover various constructs from different studies. The vivid research design survey method will be operationalized to gather primary data on Gen AI chatbot adoption

among students in Uttarakhand. The proposed study will involve integration of primary and secondary data sources.

Survey location and Target respondents

The planned study intended to be carried out in Uttarakhand state of India. The sampling frame for the study will be the students from Uttarakhand state. As per AISHE Report 2021-22, the particulars of higher education institutions in Uttarakhand are as follows:

Table 2.3: Summary of various types of Universities in Uttarakhand

Type of University	Count
Central University	1
Institute of National Importance	4
State Public University	10
State Open University	1
State Private University	19
Deemed University-Government	1
Deemed University-Government Aide	1
Deemed University-Private	1
Total	**38**

Source: *AISHE Report 2021-22*

Sample Size and Sampling Technique

Firstly, as to determine the number of students at the universities listed in Table 6.1, we will visit their websites or contact the universities directly. Once we have this information, we will calculate the proposed sample size using the (Krejcie, 1970). The sample size will be adjusted to account for potential non-responses. We will use an appropriate sampling technique to gather responses from the chosen respondents, ensuring that the sample is representative and the findings are reliable.

Data collection

A self-administered standardized questionnaire will be operationalized for gathering primary data as a survey instrument. The draft questionnaire for collecting the data will be adapted from well-established theories in the literature. After conducting a pilot study, the questionnaire will be reviewed and revised, if applicable before administering the same to the target respondents.

Proposed Statistical Tools

Descriptive type statistics will be used to explain the basic features of the data collected. The Parametric and/or Non-Parametric tests and "Structural Equation Modeling" (SEM) techniques will be used to examine structural associations between computed variables and latent constructs. MS-Excel, R-Studio, SPSS, Biblioshiny, SmartPLS etc. will be used to analyze the data.

e) Significance of the study

This study is significant as it addresses a critical gap in the literature regarding the adoption of Gen AI chatbots in the Indian educational context, particularly in Uttarakhand. By identifying and analyzing the factors that influence students' adoption of these technologies, the research will contribute to the growth of more effective and user-centric Gen-AI chatbots in educational institutions. The outcome will also deliver valuable understandings for educators, technology developers, and policymakers to enhance the incorporation of Gen-AI chatbots in education, ultimately improving student engagement and their learning outcomes. Moreover, the proposed comprehensive model will deliver a conceptual framework for future researchers on technology adoption in educational contexts, especially in emerging markets like India.

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Month wise Plan of Work

S.No	Activities	Month-Year
1.	Thesis Proposal defence	August 2024
2.	Extended Literature Review	September 2024
3.	Questionnaire designing	October 2024
4.	Pilot testing and refinement of questionnaire	November 2024
5.	Data Collection	December 2024
6.	Data preparation	January 2025
7.	Data Analysis and Results	February 2025
8.	Chapter 1 & 2	April 2025
9.	Chapter 3 & 4	June 2025
10.	Thesis writing, publications and other requirements	September 2025
11.	Thesis Submission	November 2025

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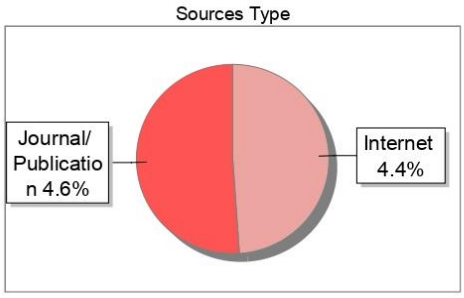

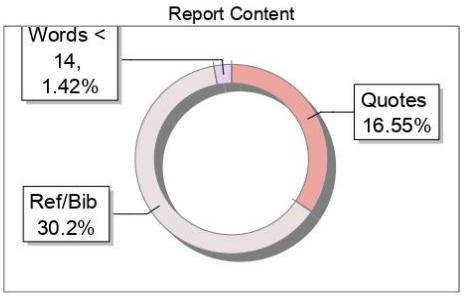

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Database Selection

Language	English
Student Papers	Yes
Journals & publishers	Yes
Internet or Web	Yes
Institution Repository	Yes

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Annexure-1 (Details of research paper reviewed)

S. No.	Title	Authors	Year	Study Participants (Students/Teacher/ Staff etc.)	Statistical Analysis	Research Approaches	Sample size	Researched (LMS/ICT/Chat GPT etc) Technologies	Research Location	Findings & Suggestions	Models	Database
1	"A comparison of faculty and student acceptance behavior toward learning management systems."	Kim, Yoon & Kim	2021	Mixed (Students and lecturers)	SEM (PLS)	Quantitative	376	Chatbot integrated LMS	South Korea	The main influencers of acceptance behavior are indidual's self-efficacy, enjoyment by using new technology, and computer anxiety associated with the new technology. However, self-efficacy, enjoyment, and computer anxiety have a significant influence on "perceived ease of use" of a LMS.	Extended TAM (TAM , self-efficacy, subjective norm, enjoyment, and computer anxiety)	Scopus

2	Understanding the impact of knowledge management factors on the sustainable use of AI-based chatbots for educational purposes using a hybrid SEM-ANN approach.	Mohammed A. Al-Sharafi, Mostafa Al-Emran, Mohammad Iranmanesh, Noor Al-Qaysi, Noorminsha h A. Iahad & Ibrahim Arpaci	202 2	Students	Hybrid SEM-ANN approach	Quantitativ e	448	Chatbot	Malaysia	1.) perceived usefulness is one of the significant factors affecting the sustainable use. 2.)students tend to be satisfied with a simple and relevant service that they regard as useful.3.)service providers are required to pay special attention to perceived usefulness, expectation confirmation, and KM variables and ensure that these factors are met for the demographic profile of the learners	expectation confirmation model (ECM) (expectation confirmation,percei ved usefulness, and satisfaction), combined with the knowledgemanage ment (KM) factors (knowledge sharing(KS), knowledge acquisition(KAc),a nd knowledge application(KA)) to understand sustainable use of chatbots	Scopus

3	Understanding Student Acceptance and Use of Chatbots in the United Kingdom Universities: A Structural Equation Modelling Approach	,David Bell &Mohamad Merhi	2020	Students	SEM (PLS)	Quantitative	431	Chatbot	London	1. Performance Expectancy, Effort Expectancy and Habit are significant predictors. 2. First paper to use UTAUT2 model to examine chatbots acceptance by higher education students. To boost 'Performance Expectancy', the higher education teachers and institutions should strive to showcase the benefits of chatbots adoption in enhancing academic outcomes. 3. Further, 'Ease of Use' could boost user-friendliness and same can be demonstrated by means of simplified interfaces, providing brief tutorials and introduction of effective and responsive chatbots for the students, and in the nutshell will enhance 'effort expectancy'. 4. The higher education institutes should integrate chatbots with academic routines such as submission of	UTAUT2	Scopus

										assignments, facilitating reminders and routine inquiries which may aid to habit formation in students. 5. The papers show direction to future scholars by seeking investigation into factors such as 'social influence' or 'facilitating conditions'		

4	AI-based chatbots adoption model for higher-education institutions: A hybrid PLS-SEM-neural network modelling approach	Mohd Rahim, N.I.; A. Iahad,N.; Yusof, A.F.; A. Al-Sharafi, M.	2022	Students	SEM-ANN	Quantitative	300	Chatbot	Malaysia	1. Design, Interactivity, ethics and perceived trust significantly influences users' 'intention to use' chatbots in higher education institutions. 2. Performance Expectancy plays a crucial role in influencing 'behavioural intention'. 3. Whereas, 'Social Influence' and 'facilitating conditions' did not shows the positive influence towards 'behavioral intention'. It could be inferred that the user could rely on his 'personal experience' and 'perceived utility' rather than societal opinions or institutional support mechanism. 4. Neural Network Model Accuracy was found to exhibit high level of prediction accuracy. 5. The study suggested that the focus on 'user experience', 'training and awareness programs', 'Longitudinal studies' and 'quality research'	UTAUT2 Combined with(chatbot adoption success factor framework in the private service sector (design, ethics, and interactivity))	Scopus

										may accelerate the adoption of chatbots in higher education institutions.		

5	To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology.	Artur Strzelecki	2023	Students	SEM (PLS)	Quantitative	534	ChatGPT	Poland	1. 'Habit', 'Performance Expectancy' and 'Hedonic Motivation' significantly influences students' 'behavioral intention to use'. 2. However, 'Habit' was identified as the strongest influencer amongst all.'Behavioral intention' was identified to be the influential factor affecting 'use behavior'. 3. 'Facilitating Conditions' such as 'resources' and 'support' accessible to students was identified to have a direct	UTAUT2	Scopus

										influence on 'behavioral intention' and 'use behavior'. 4. The 'hedonic motivation' positively influences 'behavioral intention'. 5. The suggestions for future researcher indicates need to do longitudinal studies, exploration of 'additional moderators' and evaluation of effectiveness if training programmes.		

6	Exploring intention of undergraduate students to embrace chatbots: from the vantage point of Lesotho.	Musa Adekunle Ayanwale and Rethabile Rosemary Molef	2024	Students(UG)	SEM covariance based	Quantitative	842	Chatbot	Lesotho	'Relative advantages' such as Increased efficiency and convenience influenced significantly the 'Behavior Intention'. Similarly, 'Compatibility' variable was found with high predictor of ' Behavioral Intention' . 'Trialability' was found to be 'crucial enabler' of 'Behavioral Intention'. However, 'perceived usefulness' and 'ease of use' could not find to influence 'behavioral intention'.The study suggested to incorporate more trial opportunities for the students(Trialability), aligning the chatbots with academic contexts by addressing individual students need (Compatibility) and fostering trust and awareness programs(Perceived trust) for the students.	Theory of diffusion of innovation	Scopus

7	ChatGPT adoption and anxiety: a cross-country analysis utilising the unified theory of acceptance and use of technology (UTAUT)	Tribikram Budhathoki, Arar irar,Eric Tchouamou Njoya and Achyut Timsina	2024	Students	SEM	Quantitative	239	ChatGPT	United Kingdom	'Adoption intention' is significantly influenced by 'Performance Expectancy'. In U.K, 'adoption intention' is impacted by 'Effort expectancy' .The students' 'intent to use ChatGPT' is affected by 'Social Influence'. In UK, 'adoption intention' is negatively influenced by 'Anxiety' but this is not true for Nepal. 'Use behavior' cannot be predicted by 'facilitating conditions'	UTAUT + Anx(Anxiety)	Scopus

8	Investigating student acceptance of an academic advising chatbot in higher education institutions.	Ghazala Bilquise, Samar Ibrahim, Sa'Ed M.Salhieh	2023	Students	SEM (PLS)	Quantitative	207	Chatbot	UAE	This paper concludes that 'social influence' plays a most significant role in influencing advising chatbot adoption. To encourage chatbots adoption, the higher education institution must align chatbots with 'social norms' by enhancing chatbots visibility through students' social group. 'Perceived ease of use' and 'anthropomorphism' also significantly influences chatbots acceptance. Developers should give weight to features such as chatbot interactivity and anthropomorphism with reference to Chatbots languages, its communication styles, its response times, accuracy and additionally integrating emojis as to give emotional touch to chatbots. This study calls upon future researchers to investigates other constructs and mediating	UTAUT+ Self Determination Theory(SDT)+ the service Robot Acceptance(sRAM) model	Scopus

										variables such as age, culture and stickiness that may impact students' intention to adopt the chatbots.		

9	Understanding the diffusion of AI-generative (ChatGPT) in higher education: Does students' integrity matter?	Mohammed Bouteraa , Saeed Awadh Bin-Nahwan, Meshari Al-Daihani, et.al	2024	Students (Non-Science)	SEM(PLS)	Quantitative	921	ChatGPT	ASEAN	The findings indicates that 'performance expectancy' and 'social influence' positively affects 'use behavior'. However, use behavior is negatively affected by Students' Integrity. But Students' integrity positively moderates 'effort expectancy'. 'Use behavior' is positively influenced by 'Personal anxiety'.	UTAUT + Social cognitive theory(SCT)	Scopus

10	Investigating undergraduate students' perceptions and awareness of using ChatGPT as a regular assistance tool: A user acceptance perspective study.	Hayder Albayati	2024	students	SEM(PLS)	Quantitative	603	ChatGPT	ONLINE	In this study, the 'perceived ease of use' and 'perceived usefulness' is found to be significantly affecting students' attitudes towards ChatGPT . The insight emphasizes the designing of a 'user-friendly interfaces' and awareness about ChatGPT's benefits to improve the 'student engagement'. 'Privacy' and 'security' constructs were also flagged as crucial determinants affecting students' perceptions. Though the privacy variable could not significantly influence 'perceived ease of use' , but positively impacts its 'perceived usefulness'. 'Social influence' was identified as a crucial variable while enabling positive perception about the ChatGPT usage in society.	TAM+P+T+SI+SE	Scopus

11	Investigating factors of students' behavioral intentions to adopt chatbot technologies in higher education: Perspective from expanded diffusion theory of innovation.	Musa Adekunle Ayanwale and Mdutshekelwa Ndlovu	2024	Students	Hybrid SEM-ANN approach	Quantitative	842	Chatbot	Malaysia	The research concludes that Students perceive chatbots as beneficial for their academics. It further highlights that 'Adoption intention' of chatbots is influenced by 'compatibility' construct. Moreover, Chatbot usage by the students is influenced by 'Trialability'. But, 'intention to adopt' is influenced by 'trust' in chatbots. Surprisingly, no direct linkage noticed between 'perceived usefulness' towards chatbots and 'behavioral intention' to adopt chatbots. Additionally , 'Awareness' regarding benefits of chatbots is key for its adoption. The findings looks forward for further research as to figure out complexities involved in adoption of chatbots.	Theory of Diffusion of Innovation+ TAM	Scopus

12	To use or not to use? Understanding doctoral students' acceptance of ChatGPT in writing through technology acceptance model.	Zou and Huang	2023	Students (Ph.D)	SEM	Quantitative	242	ChatGPT	China	'Intention to use' is high in Ph.D scholars and 'Behavioral intention to use' is significantly predicted by 'Attitude'. 'Use-experience' influences 'perceived ease of use' 'Perceived usefulness' is positively affected by 'perceived ease of use'.	TAM	WoS
13	Applying a modified technology acceptance model to explain higher education students' usage of ChatGPT: A serial multiple mediation model with knowledge sharing as a moderator.	Cong Doanh Duong, Trong Nghia Vu, Thi Viet Nga Ngo	2023	Students	SEM	Quantitative	1389	ChatGPT	Vietnam	**effort expectanc**y not only directly affected students' **actual usage** of ChatGPT, but also serially indirectly increased their actual use of ChatGPT through **performance expectancy** and i**ntentions** to use ChatGPT. Additionally, **knowledge sharing** was found to significantly increase higher education students' transformation from having the intention to use ChatGPT to actual users of ChatGPT.	Modified TAM	WoS

14	ChatGPT in higher education: factors influencing ChatGPT user satisfaction and continued use intention.	Chengcheng Yu, Jinzhe Yan and Na Cai	2024	Students	SEM	Quantitative	328	ChatGPT	United States	The findings confirm that ChatGPT's compatibility and efficiency directly determine its perceived capabilities, and that perceived ease of use and usefulness are two key factors influencing users' satisfaction with and willingness to continue using ChatGPT.	TAM	WoS
15	Drivers of generative AI adoption in higher education through the lens of the Theory of Planned Behaviour	Stanislav Ivanov, Mohammad Soliman, Aarni Tuomi, Nasser Alhamar Alkathiri, Alamir N. Al-Alawi,	2024	Mixed (Students and lecturers)	SEM(PLS)	Quantitative	130 lecturers and 168 students= 298	GenAI	International	Perceived strength and benefits are having significant impact on Attitude,Subjective norms and perceived behavioural control. Whereas Perceived Weakness do not impact Attitude, Subjective norms and perceived behavioural control.However, perceived risk is having negative effect on attitude for lecturers.	Theory of planned behaviour	WoS

16	Understanding students' adoption of the ChatGPT chatbot in higher education: the role of anthropomorphism, trust, design novelty and institutional policy.	Athanasios Polyportisa, and Nikolaos Pahos	2024	Students	SEM (Using STATA 14 software)	Quantitative	355	ChatGPT	Netherlands	'Attitude' and 'behavioral intention' significantly impact 'use behavior'. 'Performance expectancy', 'social influence', and 'facilitating conditions' positively affect 'behavioral intention' . 'Attitude' is positively affected by 'Anthropomorphism', 'design novelty', and 'trust'. 'Institutional policy' is constraining adoption by compromising the relationship between 'behavioral intention' and 'use behavior'.It is suggested to focus on upgrade design of chatbot as to enhance 'anthropomorphism and trust'.	meta UTAUT	WoS

17	Examining Students' Acceptance and Use of ChatGPT in Saudi Arabian Higher Education	AbuElnasr E. Sobaih , Ibrahim A. Elshaer and Ahmed M.Hasanein	2024	Students(Management)	SEM (PLS)	Quantitative	520	ChatGPT	Saudi Arabia	The findings of structural equation modeling partially supported the UTAUT and previous research in relation to the significant direct effect of performance expectancy (PE), social influence (SI), and effort expectancy (EE) on behavioral intention (BI) on the use of ChatGPT and the significant direct effect of PE, SI, and BI on actual use of ChatGPT. the results did not support earlier research in relation to the direct relationship between facilitating conditions (FCs) and both BI and actual use of ChatGPT, which was found to be negative in the first relationship and insignificant in the second one.	UTAUT2	WoS

18	Modeling Students' Perceptions of Chatbots in Learning: Integrating Technology Acceptance with the Value-Based Adoption Model.	Ahlam Mohammed Al-Abdullatif	2023	Students	SEM (PLS)	Quantitative	432	Chatbots	Saudi Arabia	The Findings in the paper suggests that 'perceived usefulness' and 'perceived value' significantly influences students' 'attitudes' towards chatbot 'acceptance', whereas 'perceived risk' lacks significant impact on attitudes or acceptance of the students. 'Perceived Enjoyment' was found to positively impact 'perceived value', however failed to impact 'attitude'. Likewise, 'ease of use' influences 'perceived value' rather than students' 'attitudes' towards chatbot. The findings further indicate a need for a clearly designed and user-friendly chatbots and well specified interfaces, with educational content fit, availability of interactive feedback mechanism, and learning experiences are to be aided by gamification. Further. Students	TAM+VBM(Value based model)	WoS

										need to be updated regarding privacy risks associated with chatbots which may build up trust in students towards chatbots.		

19	Revolutionizing education: Artificial intelligence empowered learning in higher education.	Rahiman & Kodikal,	2024	Teachers	SEM	Quantitative	250	AI chatbots	Peru	The study suggests that chatbot developers should prioritize usability by simplifying chatbot interfaces and ensuring compatibility across multiple devices. Furthermore, educational institutions should focus on training and awareness programs about chatbots' functionality, privacy, and data protection. To increase student engagement, incorporating gamified learning elements and customizing chatbot interactions to students' individual needs is proposed. These strategies could foster positive attitudes and greater acceptance for chatbot-based learning in universities.	UTAUT	WoS

20	Acceptance of AI in Semi-Structured Decision-Making Situations Applying the Four-Sides Model of Communication —An Empirical Analysis Focused on Higher Education.	Greiner, C., Peisl, T. C., Höpfl, F., & Beese, O.	2023	Diverse experience in grading	MAXQDA	Qualitative	10	AI	Germany	The Findings highlights that grading carried out by AI is well accepted, provided, that 'transparency' in process adopted and 'human oversight' are affirmed, confirming requirement for AI tools to back clear and actual communication. Though many respondents revealed partial trust in AI grading process by expecting a human intervention for validating AI decisions. The paper suggests integrating traceability feature in AI decision making, which may improve transparency and will lead to higher acceptance.	TAM combined with four sides communication model	WoS

21	Investigating university students' intention to use mobile learning management systems in Sweden.	Asher Irfan Saroia and Shang Gao	2019	Students	SEM (PLS)	Quantitative	130	mLMS	Sweden	This paper investigates higher education students' 'intentions to use' m-LMS in Sweden by operating an extended TAM model as to identify the variables impacting adoption. The outcomes reveals that 'perceived usefulness' and 'perceived ease of use' are the key in influencing their attitudes toward mobile-LMS. Particularly, PU strongly impacted 'behavioral intention to use' m-LMS, while peripheral variables such as 'perceived mobility value' and 'academic relevance' supporting considerably to PU. 'Perceived Mobility Value' reveals the significance of portability and time convenience of m-LMS's, however 'Academic Relevance' stresses its bearing to academic activities, which improves their	Extended TAM	WoS

										‘perceived value’ of mobile-LMS. Nonetheless, ‘university management support’ demonstrated indirect influences, predominantly increasing ‘ease of use’ simply not directly influencing ‘Perceived usefulness’. The researcher suggests that the academic institutions should boost m-LMS features and functionality to back ‘academic relevance’ and to ensure mobility. They further propose for technical support, efficient user training, and more user-centred design as to weakened the navigation challenges and further increase user engagement. Moreover, they suggested integration of mobile-LMS with many other educational tools as well.		

22	Economics students' behavioural intention and usage of ChatGPT in higher education: a hybrid structural equation modelling-artificial neural network approach.	iddrisu Salifua,b , Francis arthurc Richard Solomon osei-Yawe	2024	Students (Economics)	SEM-ANN	Quantitative	306	ChatGPT	Ghana	The variables such as 'design quality' and 'interactivity' significantly boosted 'perceived trust' highlighting that the student users are more likely to use ChatGPT if they are able to trust ChatGPT's functionality and effectiveness. The paper suggests improving technological literacy by providing relevant training and workshops.	UTAUT2	WoS

23	AI Chatbots in Chinese higher education: adoption, perception, and influence among graduate students—an integrated analysis utilizing UTAUT and ECM models.	Salifu, I., Arthur, F., Arkorful, V., Abam Nortey, S., & Solomon Osei-Yaw, R	2024	Students	SEM (PLS)	Quantitative	373	Chatbot	China	The research demonstrates the validity of 7 out of 11 proposed hypotheses, emphasizing the prominence of ECM constructs such as "Confirmation" and "Satisfaction," notwithstanding the influence of UTAUT constructs on users' behavior. Particularly, users' perceived confirmation notably impacts their satisfaction level and backing intention to continue using AI based Chatbots. Furthermore, "Personal innovativeness" surfaces as a crucial determining factor shaping behavioral intention.	UTAUT and ECM	Scopus

24	Investigating the acceptance of applying chat-bot (Artificial intelligence) technology among higher education students in Egypt.	Ragheb, M. A., Tantawi, P., Farouk, N., & Hatata, A.	2022	Students	SEM	Quantitative	385	Chatbot	Egypt	The findings of this study highlighted a substantial influence of independent variables on students' behaviour intention. No impact of age and gender found on performance expectancy, effort expectancy, social influence, and behaviour intention. However, this study highlighted some suggestions for decision makers such as providing suitable training and courses on chat-bots technology for students and teachers in their educational process.	UTAUT	Scopus

25	Analysis of college students' attitudes toward the use of ChatGPT in their academic activities: effect of intent to use, verification of information and responsible use.	Acosta-Enriquez, B. G., Arbulú Ballesteros, M. A., Huamaní Jordan, O., López Roca, C., & Saavedra Tirado, K.	2024	Students	SEM (PLS)	Quantitative	499	ChatGPT	Peru	The research concludes that 'ease of use', 'responsible use intentions', and 'positive emotions' contribute to students' 'intention to use ChatGPT'. Furthermore, 'Acceptance' and 'intentions to verify information' also impacted 'responsible usage', though 'negative emotions' and 'perceived risks' appeared to be a slight negative influence. Students were concerned about privacy, emphasizing the need for AI tools to be transparent and provide data security. The authors of the paper recommended that the higher education institutions (HEIs) foster responsible usage, initiate data security measures, and inspire optimistic emotional engagement in ChatGPT. Adding AI literacy into curricula is suggested to	UTAUT2, attitudional component of Mitcham's philosophical framework, PATT-SQ-SE model	Scopus

										amplify educational deliverables and stand-in critical evaluation related skills among students.		

26	Acceptance and use of ChatGPT in the academic community.	Strzelecki, A., Cicha, K., Rizun, M., & Rutecka, P.	2024	Students and Teachers	SEM(PLS)	Quantitative	629	ChatGPT	Poland	The outcome indicates that "Habit," "Performance Expectancy," and "Hedonic Motivation" are significantly impacting “behavioral intention”, whereas "Behavioral Intention" significantly influences “use behavior”. "Age" is moderator in the connection between "Price Value" and "Behavioral Intention," inferring elder academician may not be inclined to pay for AI tools even if beneficial. The future researchers must analyse qualitative data on academicians’ attitudes and there is scope of research on acceptance in diverse teaching perspectives.	UTAUT2+PI	WoS

27	Understanding Teachers' Perspective toward ChatGPT Acceptance in English Language Teaching.	Mutammimah, H., Rejeki, S., Kustini, S., & Amelia, R.	2024	Teachers	SEM	Quantitative	114	ChatGPT	Indonesia	The outcome highlights that perceived usefulness and perceived ease of use substantially influenced "Attitude", which inline impacted behavior intention and actual use. Particularly, teachers who felt ChatGPT is useful and easy to work with shown higher integration and acceptance level. The author suggested including training on digital literacy as to resolve perceived challenges as well as adopting ChatGPT with strategic curriculum integration	TAM	WoS

28	A longitudinal study on artificial intelligence adoption: understanding the drivers of ChatGPT usage behavior change in higher education.	Polyportis, A.	2024	Students	SEM	Quantitative	222	ChatGPT	Netherlands	The research demonstrated considerable decline in use behavior, trust over technology, and perceived behavioral control through the two stages, T1 and T2. The construct Emotional creepiness, nevertheless, declined, suggesting greater awareness with the technology. The crucial findings of the research suggest that the individuals' trust and their perceived behavioral control induced usage behavior positively, while emotional creepiness shows a negative influence.	UTAUT + temporal dynamics	WoS

29	ChatGPT as a CALL tool in language education: A study of hedonic motivation adoption models in English learning environments.	Qu, K., & Wu, X	2024	Students	SEM	Quantitative	189	ChatGPT	United Kingdom	The research boosted user interfaces to enhance Perceived usefulness and moderate boredom for enhanced immersion, specifically addressing ESL students' unique challenges with new technologies and language learning.	hedonic motivation system adoption model (HMSAM)	Wos

30	From concerns to benefits: a comprehensive study of ChatGPT usage in education.	Jo, H.	2024	Students	SEM (PLS)	Quantitative	273	ChatGPT	South Korea	The research concludes that self-learning capability has a positive impact on knowledge acquisition and its application, resulting in individual impact. Although, Personalization has enhanced novelty value and its perceived benefits, which in line enhanced behavioral intention. Innovativeness was linked to both greater behavioral intention and the actual use of chatGPT. The identified inhibitors were Privacy concerns regarding use of ChatGPT , technophobia with reference to chatGPT, and their guilt feelings.• It suggested to make ChatGPT interfaces user-friendly and educational courses to relieve technophobia.	Self-determination theory, diffusion of innovation, TAM, privacy theory and technostress, affect theory, and theory of planned behavior	WoS

31	Examining students' intention to use ChatGPT: Does trust matter?	Rahman, M. S., Sabbir, M. M., Zhang, J., Moral, I. H., & Hossain, G. M. S	2022	Students	SEM	Quantitative	344	ChatGPT	Bangladesh	The research shows that the perceived usefulness of chatgpt, ease of use of chatgpt, and informativeness of chatgpt notably influenced students' attitudes toward ChatGPT, impacting their intention to use the chatgpt technology. Especially, trust on chatgpt moderated the connection between perceived enjoyment of using chatgpt and attitude towards chatgpt, showcasing enjoyment influential only when an individual is having trust on chatgpt. Nonetheless, trust showed no substantial moderating effect on perceived usefulness of chatgpt, perceived ease of use of chatgpt, perceived informativeness of chatgpt.The research suggested improving trust and delivering on privacy concerns as to improve	TAM	WoS

										adoption rates of chatgpt. It further recommends highlighting the advantages and ease of ChatGPT to prospective users.		

32	Exploring Factors Shaping Chinese English Learners' Engagement with Large Language Models for Vocabulary Learning.	Wang, X., & Reynolds, B. L.	2024	Students	SEM	Quantitative	568	ChatGPT	China	The researchers found that the individuals' perceived autonomy, individuals' perceived competence, individuals' relatedness, individuals' performance expectancy, individuals' effort expectancy, and social influence on individuals' substantially impacted individuals' behavioral intention to utilize language models. Effort expectancy of an Individual learner appeared as the powerful predictor,highlighting the importance of perceived ease of use construct. Thought, Facilitating conditions was not significantly affecting intention to use.The authors suggested including large language models tools in educational context to foster personalized learning for individuals and stressed upon designing a user-	SDT(Self-determination theory)+ UTAUT	WoS

										friendly interfaces.		

33	Factors Affecting the Adoption and Use of ChatGPT in Higher Education	Alshammari, S. H., & Alshammari, M. H.	2024	Students		Quaantitative	136	ChatGPT	Saudi Arabia	Effort Expectancy and Social Influence did not support Behavior intention . However, Performance Expectancy and Facilitating Condition supported behavior intention.	UTAUT	WoS
34	Adoption of AI-Chatbots to Enhance Student Learning Experience in Higher Education in India	Sandu, N., & Gide, E.	2019	Students	Descriptive statistics	Quaantitative	47	Chatbots	India	The research identified that AI chatbots are capable to advance communication, enhance teaching efficiency, and regulate student engagement. Further, it is identified that there is growing acceptance of AI in providing personalized and interactive learning platforms in education sector.	Factors identified no model used.	WoS

35	Work-in-Progress: A Preliminary Study on Students' Acceptance of Chatbots for Studio-Based Learning	Kumar, & Silva, P. A	2020	Students	Descriptive statistics	Mixed	30	Chatbots	Malaysia	The students positively accepted chatbots due to 'ease of use', 'usefulness', 'mobile accessibility', and 'human-like communication'. Attitude towards use and Behavior Intention to continue using chatbots are positive in students. The students were not too much concerned regarding privacy. Human-like interaction and internet connectivity need to be improved.	Extended TAM	WoS

36	A Chatbot for Learning Chinese: Learning Achievement and Technology Acceptance	Chen, H. L., Vicki Widarso, G., & Sutrisno, H.	2020	Students	ANOVA, PLS	Quantitative	58	chatbots	Taiwan	'Perceived Usefulness' is the key predictor of ' behavioral intention' whereas 'Perceived Ease of Use' did not significantly influenced behavioral intention. 'Human-like interactions' and integration with social media platforms such as whatsapp is desired. Improve institutional internet access, focus on improving design of chatbots.	TAM	WoS

37	Understanding Student Acceptance and Use of Chatbots in the United Kingdom Universities: A Structural Equation Modelling Approach	Almahri, F. A. J., Bell, D., & Merhi, M	2020	Students (UG/PG-Computer Science)	SEM	Quantitative	431	Chatbots	London	The study identifies that 'performance expectancy', 'effort expectancy', and 'habit' positively influences 'behavioral intention' towards chatbots , but 'social influence', 'facilitating conditions' , and 'hedonic motivation' fails to positively influence 'behavior intention' . The research recommends to focus on enhancing chatbot features as to aid good user experience and further to integrate chatbots into learning platforms.	UTAUT2	WoS

38	AI-Based Chatbots Adoption Model for Higher-Education Institutions: A Hybrid PLS-SEM-Neural Network Modelling Approach.	Mohd Rahim, N. I., Iahad, N. A., Yusof, A. F., & Al-Sharafi, M. A.	2022	Students	SEM (ANN)	Quantitative	302	Chatbots	Malaysia	The study reveals that 'design', 'interactivity', 'ethics', and 'perceived trust' significantly impact ' behavioral intention' whereas 'effort expectancy', 'social influence', and 'facilitating conditions' fails to positively support 'behavior intention'. The research suggests enhancing 'design' to aid good 'user experience' and 'trust', and preference for ethical considerations as to develop confidence in users technology use.	UTAUT3	WoS

39	Adoption of Chatbots for Learning among University Students: Role of Perceived Convenience and Enhanced Performance	Malik, R., Shrama, A., Trivedi, S., & Mishra, R.	2021	Students	SEM	Quantitative	372	Chatbots	India	The research indicates significant positive affect of 'perceived usefulness', 'ease of use', 'convenience' on the 'intention to adopt' chatbots.The research recommended enhancement in 'accessibility and usability' and 'personalized learning experiences' to accelerate adoption of chatbots .	Extended TAM	WoS
40	The Evaluation of Chatbot as a Tool for Health Literacy Education among Undergraduate Students.	Mokmin, N. A. M., & Ibrahim, N. A.	2021	Students	Descriptive statistics	Qualitative and quantitative	75	chatbots	Malaysia	The result highlights that 73.3% of students responded that the chatbots are useful for their learning regarding health issues.	UTAUT2	WoS

41	Investigating student acceptance of an academic advising chatbot in higher education institutions.	Bilquise, G., Ibrahim, S., & Salhieh, S. E. M.	2024	Students	SEM(PLS)	Quantitative	207	chatbots	United Arab Emirates	The research highlights that 'Social Influence' and 'Perceived Ease of Use' had significant influence on students' 'intention to adopt' the chatbot, whereas 'Perceived Usefulness', 'Trust', and 'Autonomy' failed to show significant influence.'Social norms' and 'ease of interaction' are crucial for chatbot adoption, highlighting 'user-friendliness' for greater acceptance. Integrating anthropomorphic features, such as Integration of empathetic responses and designing interaction enabled chatbots are the future direction.	TAM, UTAUT, self-service technologies models, the Service Robot Acceptance (sRAM) model, Self Determination Theory (SDT) model	Scopus

42	The Merlin Project: Malaysian Students' Acceptance of an AI Chatbot in Their Learning Process.	Mai, N. E. O.	2024	Students	SEM(PLS)	Quantitative	413	chatbots	Malaysia	The study highlights that 'perceived ease of use' is negatively related to 'intention to adopt' , however students' 'perceived usefulness' positively but insignificantly impacts their 'intention to adopt'. Moreover, 'time-saving feature' , 'academic self-efficacy' and 'electronic word-of-mouth' showcases a direct and positive influence on their 'intention to adopt'. The study further reveals that students' 'actual use' of AI-bases chatbots is positively and significantly impacted by their 'intention to use' chatbot Lastly, the 'time saving feature' is having the strongest influence on students' 'intentions to use' chatbots.	TAM	Scopus

43	Investigating the Acceptance of Applying Chat-Bot (Artificial Intelligence) Technology among Higher Education Students in Egypt.	Ragheb, M. A., Tantawi, P., Farouk, N., & Hatata, A.	2022	Students	Sem, descriptive, correlations, regressions	Quantitative	385	chatbots	Egypt	This research found that 'performance expectancy', 'effort expectancy', and 'social influence' significantly impacts students' 'behavioral intention to adopt' chatbots in higher education institute of Egypt. Whereas 'age' and 'gender' failed to behave like a moderator The study flagged the need for imparting training by educational institutions to both students and faculties facilitating effective utilization of chatbots, which in turn enhance familiarization and adoption of chatbots. Additionally, integration of chatbots into academics as to accelerate wide scope AI utilization in learning.	UTAUT, Experience and voluntariness removed as Moderator. Facilitating condition and behavior use also removed as construct from the original mode.	Scopus

44	Design and Acceptance of Chatbots for Information Automation in University Classrooms	F. Rejón-Guardia & G.A. Vich-I-Martorell	2020	Students	SEM	Quantitative	432	chatbots	Spain	The main feature of chatbot is providing personalized interaction	UTAUT2	Scopus
45	Using Chatbots as AI Conversational Partners in Language Learning.	Belda-Medina, J., & Calvo-Ferrer, J. R. (	2022	Teachers	SEM(PLS)	Qualititave and quantitative	176 (115 spain+ 61 poland)	chatbots	Spain and Poland	The finding suggests that the 'perception towards chatbot integration' with language learning has resulted in 'ease of use' and 'engagement' . Gender differences were noted in the appreciation for chatbot 'design features' were moderated by 'gender' with female respondents were more inclined towards 'customization options'. Additionally, inclusion of extra 'adaptive features' and enhancing 'chatbot design' may lead to 'user satisfaction'.	Extended TAM	WoS

46	AI Chatbot Adoption in Academia: Task Fit, Usefulness and Collegial Ties.	Soodan, V., Rana, A., Jain, A., & Sharma, D	2024	Teachers	SEM(Covariance based), CFA	Qualititave and quantitative	448	Chatbots	India	Findings suggests that the 'task and technology characteristics' has significantly impacted 'task technology fit' in turn which positively influenced 'perceived usefulness' and 'usage intention'. Also, 'Social network density' was identified to have a strong impact on both 'technology task fit' and 'perceived usefulness' but 'homophily' and 'connectedness' showed light effects. The research futher suggested upgrading 'chatbot design' as to facilitate fit into academic tasks and must leverage peer networks to boost its adoption.	Extended TAM	Scopus

47	Students' adoption of AI-based teacher-bots (T-bots) for learning in higher education	Pillai, R., Sivathanu, B., Metri, B., & Kaushik, N.	2024	Students	SEM (PLS)	Quantitative	1380	Chatbots	India	The research concluded that constructs 'ease of use' , 'personalization', 'interactivity', and 'trust' significantly impacted students' 'intention to adopt' T-bots. Though, students' liking for 'human teachers' behaved like a moderating, inferring that the students' preference inclined towards 'human teachers' but are willing to adopt chatbots.The research further suggested to enhance the 'personalization' and 'anthropomorphic' features in T-bots to transform into more 'interactive' and 'relatable'. Chatbots developers are called upon to focus 'trust' building and to ensure 'data security' as to facilitate acceleration of chatbots adoption rates.	Extended TAM	Scopus

48	Modeling Students' Perceptions of Chatbots in Learning: Integrating Technology Acceptance with the Value-Based Adoption Model.	Al-Abdullatif, A. M.	2023	students	SEM (PLS)	Quantitative	432	chatbots	Saudi Arabia	The findings of the research indicates that the 'perceived value' and the 'attitude' are strongly impacting 'chatbot acceptance' although 'perceived enjoyment' and 'ease of use' are positively impacting 'perceived value' but 'perceived risk' and 'perceived usefulness' failed to show significant impact on the 'attitude'.	TAM and VAM	Scopus
49	Adoption of ChatGPT by university students for academic purposes: Partial least square, artificial neural network, deep neural network and classification algorithms approach.	Mahmud, A., Sarower, A. H., Sohel, A., Assaduzzaman, M., & Bhuiyan,	2024	Students	partial least squares (PLS), artificial neural networks (ANN), deep neural networks (DNN), and classification algorithms	Quantitative	369	chatbots	Bangladesh	In this research paper it is being identified that 'personal innovativeness' is the most crucial predictor of an 'attitude' seconded by 'self-efficacy' and followed by 'enjoyment', 'usefulness', and 'social influence' whereas 'technical complexity and cost' could not significantly impact 'attitude'.	VAM	Scopus